

Structural Design Challenges for Mars Rovers

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Abstract

On July 4, 1997 the Pathfinder Mission successfully began a new era of robotic exploration of Mars. The primary scientific payload for the Pathfinder lander is the Sojourner Truth Mars Rover, an autonomous robotic vehicle, which is exploring and conducting scientific measurements on the Mars surface. The development of the structure of the Mars Rover required innovative design and testing to overcome the mission constraints from the difficult environments during launch, cruise and surface operational phases of the mission. There were additional restraints on mass, power and volume and requirements for sterilization for planetary protection. The final design consisted of an integrated structural and thermal design utilizing lightweight thermally insulating composites with aerogel insulation. Over the next several years, a series of Rovers will explore the surface of Mars. These will range from small Nanorovers weighing less than 1 Kg to, large science rovers weighing up to 50 Kg and sample return rovers somewhere in between. Each will require specialized composite structures and sampling mechanisms to reduce mass, and provide structural thermal isolation.

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